FASTENING ELEMENT

BACKGROUND OF THE INVENTION

The invention relates to a fastening element, in a rear grip part, for introduction into a mounting opening of a hollow body, in a first position, and for rear gripping of a mounting projection arranged in a hollow body, in a second position. The fastening element has at least one stop for frontal external loading of the edges of the hollow body longitudinal walls along the mounting opening, whereby the stop is connected with the rear grip part by a fastening means. A spacer element having at least one securing means arranged for temporary fixing of the rear grip part in a first and/or in the second position is arranged between the stop and the rear grip part.

Fastening elements of the aforementioned type are used for fastening an object on a C-shaped mounting rail. The mounting rail used for this purpose can be fastened to a surface. The fastening element is introduced into the mounting opening and turned by a rotary movement by 90° such that the rear grip part of the fastening element grips behind the mounting projections of the mounting rail. In this preliminary fixing, it is possible to displace the fastening element longitudinally along the mounting rail for the purpose of adjustment. In order to effect a final fastening of the fastening element on the mounting rail, the rear grip part is clamped relative to the stop by a threaded rod and thus clamped on the mounting projections. This type of fastening element is suitable for fastening elongated objects or conduit lines, such as pipes or the like.

This type of fastening element is disclosed in DE 100 52 534 A1. A pre-loaded spring element is arranged between the nut element and the stop to make a preliminary fixation of the known fastening element. Its positions can be precisely established by virtue of a coupling between the stop and the rear grip member. The spring element has the effect that the rear grip

member is pulled up against the stop and the mounting projections are accordingly gently clamped between the rear grip member and the stop.

The drawback of the prior art solution is that the known fastening element comprises a number of co-operating elements and is expensive to manufacture.

Summary of the Invention

The object of the present invention is to provide a fastening element having a rotatable rear grip member, which allows pre-fixing, which assures correct positioning of the rear grip member relative to the holding projections. Furthermore, the fastening element is intended to comprise few parts that are simple to manufacture. Furthermore, the fastening element is intended to be easy to manage and allow simple assembly.

The object is achieved by the invention which comprises a fastening element, a rear grip part for introduction into a mounting opening of a hollow body, in a first position, and for rear gripping of mounting projections arranged in a hollow body, in a second position. The fastening element further has at least one stop for frontal external loading of the edges of the hollow body longitudinal walls along the mounting opening, whereby the stop is connected with the rear grip part by means of a fastening means. A spacer element having at least one securing means arranged for temporary fixing of the rear grip part in a first and/or in the second position is arranged between the stop and the rear grip part. The securing element is spring load mounted on a spring loaded element on the spacer element.

In the fastening element according to the invention, the function of a spring element and a coupling are combined by the spacer element and the spring-loaded securing means mounted on

the spacer element. The spacer element is configured on the rear grip member. At the time of introducing the rear grip member into the mounting opening of the hollow body, the fastening element is held in a first position, the so-called transport position. The stop encloses the hollow body at least in part such that on turning of the fastening element, the rear grip part is brought into a second position, the so-called securing position. When this is done, the securing means is also co-rotated. In the securing position, the rear grip member is preferably oriented such that it grips behind the mounting projections disposed in the hollow body. In a variant, the spacer element can be configured on the stop instead of on the rear grip member.

The securing means is mounted on at least one web, which is formed on the spacer element and is used as a spring-loaded element for the securing means. Preferably, a securing means is mounted on two webs that are disposed opposite each other and essentially permit only one movement of the securing means in one direction. Instead of webs, a bracket can be provided for the function of the spring–loaded element on the spacer element.

The distance between the stop and the rear grip member in the transport position is greater than the extent of the mounting projections of the hollow body in the sense perpendicular to the stop. In the securing position, the distance between the stop and the rear grip member is preferably only the extent of the mounting projections. Accordingly, a pre-fixing of the fastening element is provided and the fastening element can, if required, be displaced along the mounting opening until the desired position along the length of the hollow body is reached. By clamping the fastening element, the rear grip member moves in the direction of the stop until the rear grip member clamps with the holding projections and accordingly the fastening element is fixed to the hollow body. The fastening element according to the invention is used for mounting

of a mounting member on a so-called C-shaped mounting rail that previously has been attached to a structural part.

The rear grip member is preferably attached to the stop using a bolt, whereby the rear grip member is friction-locked or force-locked and the stop is rotationally connected to the bolt. The bolt preferably has a torque transmission means at the end facing away from the rear grip member, which protrudes at least in part over the stop. The bolt is configured as a screw with a hexagonal screw head.

Preferably, the spacer element is configured as a separate part. Accordingly, the manufacturing cost of the stop and of the rear grip member of the fastening element is substantially reduced relative to a design, in which the spacer element is formed directly on the stop or on the rear grip member. In addition, the fastening element is easier to implement and use. By means of different designs spacer elements, especially with the variation in height of the spacer element, the fastening element can be used in differently configured hollow bodies and mounting rails only by replacing the spacer element.

Preferably, the at least one securing means comprises a projection for engaging in at least one holder configured as a complementary securing means in a recess formed as a complemenatry securing means, wherein the securing means and the complementary securring menas co-operate form-locked in the first and/or second position. By virtue of the axial movement of the fastening element perpendicular to the stop, the fastening element is adjustable between the first position serving as the transport position and at least one other position serving as the securing position. The securing means are configured to be spring-biased on the spacer element if the form-locking connection in the transport position becomes loose at the time of a

rotational movement of the fastening element. If the complementary securing means are configured as recesses, upon loosening of the connection between the securing means and the complementary securring means, a sensory perception of this operation occurs. The complementary securing means can also be arranged such that upon reaching the securing position, the securing means lock into the corresponding recess.

In lieu of a recess, the complementary securing means can be configured as mounting devices. For example, if at least one projection is provided in the form of a discoid circular ring segment on the stop, at which the first position, or in the transport position, a securing means provided with a groove engages in the projection. Preferably, at least two projections are provided on the stop. In a variant, two projections are provided on the stop, which run the half periphery and rise helically. In this context, "helically" is defined in that the distance between the upper edge of the projection diminishes consistently in the direction of rotation towards the stop. When rotating the fastening means, the rear grip member is brought out of the securing position, whereby the securing means and consequently the rear grip member during position changeover diminishes its distance to the stop continuously until the rear grip member is pre-fixed at the mounting projections.

Advantageously, at least double as many complementary securing means are provided at the stop as securing means on the spacer element for producing at least the transport position and the at least one securing position of the fastening element. When introducing the relative movement perpendicular to the stop, the form-locking connection in the transport position as a result of the spring-loaded mounting of the securing means on the spacer element and upon reaching the securing position, which corresponds to the position relative to the rear grip member

of the mounting projections provided in the hollow body of the rear grip member, the securing means lock into the corresponding recess. In this design of the fastening element, the user is provided with a sense of security in the certainty that the rear grip member for gripping the mounting projections disposed in the hollow body are correctly aligned.

Preferably, the securing projections are configured as two opposingly arranged projections, which, in the first position, engage form-locking in two recesses of the connection, whereby the recesses receive the projections only in part. Using securing means configured as projections, a high degree of reliability against accidental loosening of the form-locking connection between the projections and the recesses is produced. Because the recesses only partially receive the projections, this form-locking connection can be released without great effort, when the rear grip member by means of a rotational movement is brought from the first position into the second position. In order to reduce the resistance of the form-locking connection at the time of a rotational movement of the fastening means and to thus facilitate the use of the fastening element for the user, the recess can have a ramp-like flattening at least in the rotational direction of the fastening element, which continuously reduces the depth of the recess.

Preferably, the complementary securing means defining the first position or the transport position have a depth X for the securing means and the complementary securing means defining the second position or the securing position have a depth greater than the depth X. This preferred embodiment of the complementary securing means makes it possible for the distance between the stop and the fastening element to be smaller in the securing position than in the transport postion. Consequently, the gripping action of the rear grip member is supported in the securing position. If the mounting opening of the hollow body is configured as a slit running the

length of the hollow body such as in the case of a C-shaped mounting rail, the arrangement of complementary securing means is required only in the transport position. If the fastening element is brought from the first position into the second position, the securing projections of the spacer element are in the plane of the mounting opening. Since the securing projections in this position do not contact any element, the distance between the stop and the rear grip member is reduced to the existing distance as the result of the height of the spacer element, whereby the rear grip member can grip the mounting projetions.

Advantageously, the spacer element is configured as an essentially annular element, which is arranged on the side of the fastening element facing away from the rear grip member. The spacer element is fixed on the rear grip member or fixed on the stop. The rotational resistance of the spacer element to the part on which the spacer element is arranged is preferably assured using securing elements that engage in complementary securing elements. In a variant, the spacer element can be stamped or molded to create a resistance to rotation between the spacer element and the other part.

Preferably, the spacer element has an elastic, optionally two clips arranged diametrically opposed to each other, that are tightened in the second position or in the securing position of the fastening element on the holding projections vertical to the stop. The clip(s) are configured as loops that have a specific deformability. Upon rotating the fastening means, the rear grip member is moved out of the transport position. Once the resistance increases, when turning the fastening means, the user knows that the rear grip member is oriented for gripping behind the holding projections. This embodiment is advantageous, if no complementary securing means are provided for the securing means in the securing position.

Preferably, the clip has an integrated stop. Using these clips, an unintentional excessive rotation of the fastening element at the time of assembly is prevented, since the integrated stop preferably produces such a high resistance at the time of deforming the clip, that the latter cannot be overcome with simple means.

The spacer element is advantageously manufactured in one piece with the securing means or with the spring-resilient elements. Prefrably, the distance part is made of a plastic in an injection mold proess. In a variant, the spacer part can be made out of sheet metal or in a stamping/bending process. Furthermore, the spacer element can be assembled from a plurality of parts, whereby different materials can be combined.

BRIEF DESCRIPTION OF THE DRAWINGS

Other advantageous embodiments and combinations of features of the invention will become apparent from the following detailed description with reference to the drawings, wherein:

Fig. 1a shows a section through the fastening element according to the invention, in the transport position;

Fig. 1b shows the fastening element of Fig. 1a, in the securing position;

Fig. 2 shows a view onto the rear grip part with the spacer element according to the invention;

Fig. 3 shows a view onto the rear grip member with an additional spacer element according to the invention, in the clamped condition;

Fig. 4 shows a view onto the spacer element according to the invention;

Fig. 5 shows a section through the spacer element according to the invention along the line V – V of Fig. 4;

Fig. 6 shows a section through the spacer element according to the invention along the line VI – VI of Fig. 4;

Fig. 7 shows a section through another embodiment of the fastening element according to the invention;

Fig. 8 shows a section through another embodiment of the fastening element according to the invention; and

Fig. 9 shows a section through the fastening element according to the invention along the line IX – IX of Fig. 8.

DETAILED DESCRIPTION OF THE INVENTION

In principle, in the figures identical parts are identified using identical references. Fig. 1a shows a section through the fastening element according to the invention, in the transport position, and Fig. 1b shows the fastening element in the secured position. The fastening element 1 is arranged in a C-shaped mounting rail 2. The mounting rail 2 has a floor 3 and two side walls 4.1 and 4.2 arranged perpendicular to the floor 3 and running parallel to each other. The free edge of the side wall 4.1 and the free edge of the side wall 4.2 are deflected inwardly such that a support surface 5.1 or 5.2 and a holding projection 6.1 or 6.2 are formed. The free edges of the holding projections 6.1 and 6.2 are provided with knurling.

The fastening element 1 comprises a back grip member 11 and a stop 12, which are connected by the screw 13. The back grip part 11 has an inside thread in which the outer thread of the screw 13 engages. The stop 12 is provided with an opening, through which the screw can be pushed. Between the stop 12 and the back grip member 11, the spacer element 11 is fixed on the back grip member 11.

The spacer element 14 has spring-biased projections 15.1 and 15.2 that engage in the recesses 16.1 and 16.2. With the form-locked connection between the projection 15.1 and the recess 16.1 as well as the projection 15.2 with the recess 16.2, the transport position of the fastening element 1 is defined and secured. In the transport position, the fastening element 1 can be mounted and can be introduced into the mounting rail 2. In this position of the fastening element 1, the rear grip member 11 is introduced through the longitudinal opening 17 into the mounting rail 2 up to the stop 112 on the support surfaces 5.1 and 5.2. In the transport position, the spacer element 14 holds the rear grip member 11 in a distance H to the stop 12, which is greater than the extent T of the holding projections 6.1 and 6.2, in the direction of the floor 3 of the mounting rail 2.

Using a rotary movement on the screw 13, the rear grip member 11 turns in the mounting rail 2 until the rear grip member 11 is in the secured position of the fastening element 1, as is shown in Fig. 1b. At the stop 12, in addition to the recesses 16.1 and 16.2, the recesses 18.1 and (not shown here) 18.2 are provided, in which the projections 15.1 and 15.2 can engage. The diametrically opposing recesses 18.1 and 18.2 are rotated relative to the diametrically opposing recesses 16.1 and 16.2 by 90° at the stop 12 and configured deeper (X1) than the recesses 16.1 and 16.2.

In order to facilitate the position changeover between the transport position and the secured position the flanks of the recesses 16.1, 16.2, recesses 18.1 and 18.2 are inclined such that, in the direction of the rotational movement for tightening the fastening means, a lesser rotary expenditure is required for the position change than in the reverse rotation for loosening the fastening means. In addition, the spacer part 14 has the clips 19.1 and 19.2, which tighten with the holding projections 6.1 and 6.2 in the securing position of the fastening element 1.

Fig. 2 shows a view onto the rear grip member having the spacer element according to the invention. The rear grip member 11 is provided with the knurlings 21.1 and 21.2, which can be brought into engagement at the holding projections 6.1 and 6.2, in the securing position of the fastening element 1. The extension B of the spacer element 14 from the outer edge of the clip 19.1 to the outer edge of the clip 19.2 is greater than the inner distance A between the holding projections 6.1 and 6.2 of the mounting rail 2, such that the spacer element 14 tightens at the holding projections 6.1 and 6.2 in the securing position of the fastening element 1 in the secured position.

Fig. 3 shows a view onto a rear grip member with an additional spacer element according to the invention in the tightened condition. The rear grip member 31 also has two knurlings 32.1 and 32.3, which can be brought into engagement with the knurlings on the holding projections 6.1 and 6.2. The spacer element 33 arranged on the rear grip elemetn 31 has two clips 34.1 and 34.2. The member 35.1 of the clip 34.1 and the member of the clip 34.2, each of which are arranged in the counter-rotational direction of the fastening element, is more massive than the corresponding other member of the clip 34.1 or 34.2. When tightening the spacer element on the holding projections, the clip segments 35.1 and 35.2 acting as integrated stops, a difficult to overcome resistance is created using simple means. This embodiment provides the user with a high degree of security regarding the effective position of the rear grip member 31 in the mounting rail 2. At the same time, over turning of the fastening element at the time of position change from the transport to the secured position is substantially prevented.

Fig. 4 shows a view onto the spacer element according to the invention. The spacer element for arrangement on a rear grip member is made of plastic in an injection molding process.

Fig. 5 shows a section through the spacer element according to the invention along the line V – V of Fig. 4. The spacer element 14 has a circulo-cylindrical base body 41 and two securing projections 15.1 and 15.2. The webs 43.1 and 43.2 as well as the webs 44.1 and 44.2 each form the spring-biased element for spring-biased mounting of the projections 15.1 and 15.2 on the base body 41 of the spacer element 14. In order to assure the rotational resistance between the rear grip part and the spacer element 14, four detent elements 42.1, 42.2, 42.3 and 42.4 are configured as projections on the base body, which engage in correspondingly arranged complementary securing elements configured as recesses on the rear grip member.

Figure 6 shows a section through the spacer element according to the invention along the line VI – VI in Fig. 4. The user of the fastening element perceives indication of the positioning of the rear grip member tactily and, if appropriate, also acoustically through locking in of the projections 15.1 and 15.2 in the recesses defining the securing position on the stop. The clips 19.1 and 19.2 clamping on the holding projections 6.1 and 6.2 serve only as an additional assurance in the assembly of the fastening element. Insofar, however, no recesses are provided on the stop in the secured position, the clips 19.1 and 19.2 are secured by their clamping with the holding projections 6.1 and 6.2 in the correct positioning of the rear grip member for gripping the holding projections 6.1 and 6.2 when tigthening the fastening element. The extension into the width B of the spacer element 14 from the outer edge of the clip 19.1 to the outer edge of the clip 19.2 is thus greater than the distance A of the inner edge of the holding projections 6.1 and 6.2 among each other of the hollow body.

Fig. 7 shows a section through another embodiment of the fastening element according to the invention. The fastening element 51 comprises a back grip member 52 and a stop 53, which are connected by the screw 54. Between the rear grip member 52 and the stop 53, the spacer

element 55 is provided, which is fixed with the rear grip member 52. Two connection sections 56.1 and 56.2 are arranged with disk-like and annular protrusion on the stop 53, whereby the projections 57.1 and 57.2 engage these connection sections56.1 and 56.2 in the transport position of the fastening element. The projections 57.1 and 57.2 are mounted spring-biased on the base body 58 of the spacer element 55. If the fastening element 51 of the transport position is brought into the secured position by turning the screw 54, the projections 57.1 and 57.2 glide along the connection sectons 56.1 and 56.2. Before reaching the secured position, the connection sections 56.1 and 56.2 terminate such that the projections 57.1 and 57.2, upon further turning of the screw 54, move in the direction of the stop 53 and the distance between the rear grip member 52 and the stop 53 is diminished. The rear grip member 52 grips the holding projections of the hollow body and the fastening element is pre-fixed in the hollow body.

Fig. 8 shows a section through another embodiment of the fastening element according to the invention. The fastening element is configured as a rail nut 61 for fastening the L-shaped bracket 62 to the mounting rail 63. The rail nut 61 comprises a back grip member 64 and a stop 65, which are connected by the screw 66. The spacer element 67 is provided between the rear grip member 64 and the stop 65. The spacer element 67 has projections 68.1 and 68.2, which engage in recesses 69.1 and 69.2 at the stop 65 and which define the transport position of the rail nut 61. The recesses 70.1 and 70.2 are rotated by 90° relative to the recesses 70.1 and 70.2, which define the secured position of the rail nut 61. A shaft 71 is formed on the stop 65, which bridges the sheeting thickness of the bracket 62 up to the support edge of the mounting rail 63. The mounting rails 63 can be connected with each other using the bracket 62. The bracket 62 is provided with two openings 72.1 and 72.2, through which the rear grip member 64 of the rail nut 61 can be introduced into the mounting rail 63. Two tabs 73.1 and 73.2 oriented against the stop

65 are formed on the spacer element 67, which hook up with the longitudinal edges of the opening 72.1 at the time of insertion of the rail nut 61 into the mounting rail 63. Accordingly, the distance between the rear grip member 64 and the stop 65 is accommodated, which allows a rotation of the rear grip member 64 on the inside of the mounting rail 63. Furthermore, the tabs 73.1 and 73.2 make possible a pre-fixing of the rail nut 61 to the bracket 62 before assembly of the bracket 62 on the mounting rail 63.

Fig. 9 shows a section through the fastening element according to the invention along the line IX – IX of Fig. 8. The stop 65 is adapted to the contour of the opening 72.1 and 72.2 so that a form-locking connection between the rail nut 61 and the bracket 62 is provided. The spacer element 67 has two deformable clips 74.1 and 74.2, which clamp, in the secured position of the rail nut 61, with the holding projections 75.1 and 75.2 on the inside of the mounting rail 63.

In sum, the fastening element according to the invention allows a pre-fixing, which assures a correct positioning of the rear grip member vis-à-vis the holding projections, whereby the fastening element comprises parts that are few in number and easy to manufacture. The fastening element is easy to handle at the time of use and makes simple and secure assembly possible.